

## Aphids of the family Eriosomatidae (Insecta: Homoptera) in Belarus Тли семейства Eriosomatidae (Insecta: Homoptera) Беларуси

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Investigation of Eriosomatidae in Belarus started in the 1900s. However, a regional checklist of Eriosomatidae aphids was not published till now. Based on material preserved in the collections of Belarusian State University and the Zoological Institute of the Russian Academy of Sciences, and data scattered across publications we have compiled the first comprehensive list of Eriosomatidae recorded from Belarus and briefly analysed it from the geographical and ecological points of views. The list includes 12 genera and 27 species. *Pemphigus passeki* Börner, 1952 has been recorded from Belarus for the first time. The registered diversity is less abundant than in the adjacent Poland. In the accordance with the global pattern of aphids host plant connections, a single species permanently inhabit woody plants (monoecious species), the other ones are dioecious and migrate from woody plants to woody (eight species) or herbaceous (12 species) plants. Four species is anholocyclic.

Исследования фауны тлей семейства Eriosomatidae в Беларуси были начаты еще в первые десятилетия XX века, однако до настоящего времени ни одного регионального списка эриосоматид не было опубликовано. Целью данной работы было обобщение сведений о Eriosomatidae Беларуси, имеющихся в разрозненных публикациях, которые были дополнены данными, полученными в ходе собственных исследований. Это позволило впервые составить аннотированный список эриосоматид фауны Беларуси и кратко проанализировать особенности их образа жизни. Список включает 27 видов из 12 родов. *Pemphigus passeki* Börner, 1952 впервые указан для фауны Беларуси. Выявленное на территории Беларуси число видов семейства оказалось меньше, чем в соседней Польше. Только один вид однодомен и постоянно обитает на одном растении-хозяине. Большинство тлей-эриосоматид фауны Беларуси являются двудомными и мигрируют с древесных растений на другие древесные (восемь видов) или травянистые (12 видов) растения; четыре вида неполноциклы, то есть развиваются без смены растений-хозяев.

**Key words:** gall-forming insects, monoecious, dioecious, Rhynchotha, Homoptera, Eriosomatidae, Aphidinae, invasive species

**Ключевые слова:** галлообразующие насекомые, однодомные, двудомные, Rhynchotha, Homoptera, Eriosomatidae, Aphidinae, инвазивные виды

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## INTRODUCTION

Belarus, a small (207 600 km<sup>2</sup>) Central European country, is located in the transitional territory between two ecological zones: the European deciduous forests and the North Eurasian evergreen coniferous forests. The country is divided into six administrative provinces (Fig. 1).

Study on Eriosomatidae was started in the 1900s, when prof. A.K. Mordvilko collected aphids in different parts of Belarus. Two species of Eriosomatidae, *Eriosoma lanuginosum* (Hartig, 1839) and *Kaltenbachiella* (as *Tetraneura*) *pallida* (Haliday, 1838), are recorded for Grodno Province by A.K. Mordvilko in his monography (Mordvilko, 1924) devoted to the wooly apple aphid (*Eriosoma lanigerum* (Hausmann, 1802)) and other Eriosomea. In 1930, Mordvilko listed for Eastern (Soviet part) Belarus 28 aphid species, including 13 species of Eriosomatidae: *Eriosoma patchiae* (Börner et Blunck, 1916), *E. lanuginosum*, *Forda formicaria* Heyden, 1837, *F. marginata* Koch, 1857 (as *Forda trivialis* Pass.), *Geioica urticularia* (Passerini, 1856), *Pachypappa vesicalis* Koch, 1856, *P.* (as *Asiphum*) *tremulae* (Linnaeus, 1761), *Pachypappella* (as *Pachypappa*) *lactea* (Tullgren, 1909), *Paracletus cimiciformis* von Heyden, 1837, *Pemphigus bursarius* (Linnaeus, 1758), *P. populinigrae* (Schrank, 1801) (as *P. filaginis* B.d.F.), *P. spyrothecae* Passerini, 1856, and *Thecabius affinis* (Kaltenbach, 1843). At the same time several cecidological papers reported cecidia-forming aphids of Western Belarus (territory of Poland at that time). Seven species of Eriosomatidae (*Eriosoma ulmi* (Linnaeus, 1758), *Pachypappa marsupialis* Koch, 1856 (as *Pemphigus marsupialis* Courcey.), *Pemphigus bursarius*, *P. populinigrae* (as *P. filaginis* B. d. F.), *P. spyrothecae*, *Prociphilus xylostei* (de Geer, 1773), and *Thecabius* (as *Pemphigus*) *affinis*) were recorded by Z. Fiedorowiczowna (1930), and four species (*Pemphigus bursarius*, *P. spyrothecae*, *P. xylostei*, *Tetraneura* (as *Schizoneura*) *ulmi*) by J. Perepeczko-Baumanowa (1934).

In 1955, G.Ch. Shaposhnikov recorded six species of Eriosomatidae, *Eriosoma lanuginosum*, *E. patchiae*, *Pachypappa warschavensis* (Nasonov, 1894) (as *Asiphum varsoviensis* Mordv.), *P. tremulae* (as *Asiphum tremulae* Deg.), *Pemphigus borealis* Tullgren, 1909, and *Pemphigus immunis* Buckton, 1896 (as *Pemphigus lichtensteini* Tullgr.), as pests of forest woody plants in Belarus (Shaposhnikov, 1955). After the 1950s a study of aphids, pests of ornamental plants, was started in Belarus by N.L. Losinskaya (1960) who recorded two species of Eriosomatidae in parks. Information on Eriosomatidae species was also given in the monographies of S.V. Gorlenko & N.A. Pan'ko (1967, 1972), S.V. Gorlenko, A.I. Blintsov & N.A. Pan'ko (1988).

Comprehensive studies of the aphid fauna in Belarus were started in the 1980s. Till now several papers on the local fauna of Belarusian regions have been published (Buga, 1989, 1995; Stekolshchikov & Buga, 2006; Buga et al., 2008; Rakauskas & Buga, 2010; Stekolshchikov et al., 2008, 2010, 2012), and a special attention was paid to species damaging woody plants (Buga & Gorlenko, 1987; Buga, 1997, 2001; Buga & Stekolshchikov, 2009). However, a general regional checklist of Eriosomatidae has not been published yet.

## MATERIAL AND METHODS

The paper is based on the material collected by authors since 1983. Although this information had been partly published in Russian or Belarusian, we prefer to repeat the collection data in English as electronic supplementary material to this paper. We also listed the material collected by T.V. Tikhomirov, F.V. Sautkin, D.L. Petrov, A.S. Roginsky & O.V. Sinchuk, and microscope slides of Eriosomatids collected by A.K. Mordvilko and stored in the collection of the Zoological Institute of RAS (St Petersburg).

Microscope slides were prepared using Faure-Berlese mounting fluid or Canada balsam (Blackman & Eastop, 2000). The

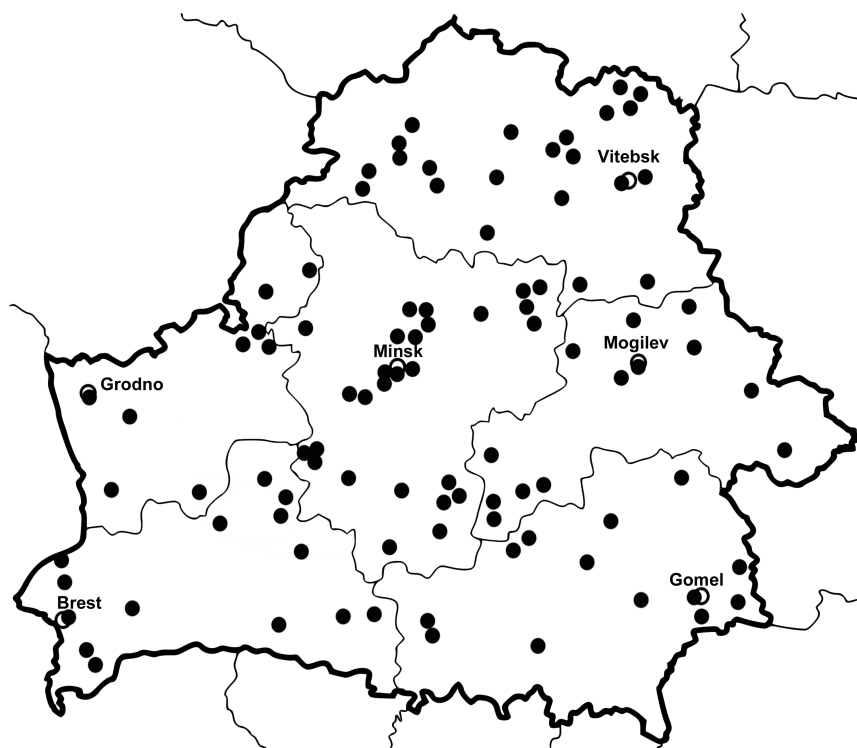


Fig. 1. Administrative provinces of Belarus and geographic points of aphid sampling and registration.

material is deposited in the Department of Zoology of Belarusian State University (Minsk, Belarus) and the Zoological Institute of RAS (St Petersburg). Data extracted from publications are given in a uniform manner, but the completeness of the data depends on the original publications. When different variants of transliteration of geographical names are more or less widely used in the literature, we provide the additional variants in parentheses after the main variant. The special keys proposed by B. Osiadacz & R. Hałaj (Hałaj & Osiadacz, 2013; Osiadacz & Hałaj, 2014) have been used for identification of *Pemphigus* Hartig, 1839 species on the basis of galls formed on poplars. Aphid synonymy follows Remaudière and Remaudière (1997) with subsequent additions (Eastop & Blackman, 2005; Holman, 2009; Blackman & Eastop, 2011; Favret, 2016). Aphid taxonomic classification follows Shaposhnikov (1964). In this classification, Eriosomatidae (as Pemphigidae) is considered as a separate family

of Aphidoidea. This opinion was also supported by Heie & Wegierek (2009).

### Abbreviations

*Collectors:* AM – A.K. Mordvilko, AR – A.S. Roginsky, DZh. – D.G. Zhorov, DP – D.L. Petrov, OS – O.V. Sinchuk, SB – S.V. Buga, VKh – V.I. Khvir, VT – V.N. Tikhomirov.

*Localities:* BBR – Berezina Biosphere Reserve, BPF – Belovezha Primeval Forest, CBG – Central Botany Gardens of the National Academy of Sciences of Belarus, hort. cv. – cultivars, NBR – Naliboki Biological Reserve, PLR – Priluki landscape reserve, RWS – railway station.

### LIST OF SPECIES

The list of species is published as an electronic supplementary material which is available from:

<http://www.zin.ru/journals/zsr/content.asp?year=2016>.

## DISCUSSION

Presently, the fauna of Belarus includes 27 species from 12 genera of Eriosomatidae. *Pemphigus passeki* Börner, 1952 has been recorded from Belarus for the first time on the basis of material collected in 1900 by A.K. Mordvilko. *Pachypappa populi* (Linnaeus, 1758) was first mentioned by S.V. Buga (2001) with reference to A.K. Mordvilko (1930); however, reexamination of the cited publication revealed that Mordvilko (1930) did not record this species directly for Belarus. Three species of *Pachypappa* Koch, 1856 are considered for Belarus according to literature data only (Mordvilko, 1930; Fiedorowiczówna, 1930 and Shaposhnikov, 1955).

The species richness in Belarus is not so high compared with the neighbouring countries like Poland (49 species, 19 genera) (Hałaj, Osiadacz & Poljaković-Pajnik, 2016; Osiadacz & Hałaj, 2009, 2010, 2012; Wojciechowski et al., 2015). One of the reasons of this is the absence of such thermophilic species as *Aploneura lentisci* (Passerini, 1856) or *Mimeura ulmiphila* (del Guercio, 1917), etc. The Eriosomatidae were more extensively studied in Minsk Province (Fig. 1). Data from Belarus Lakeland (Poozer'e) were received mainly from the Gorodock Highland (Rakauskas & Buga, 2010).

The majority of registered species are common for Europe or the Palearctic. At least one species, *Pemphigus borealis* Tullgren, 1909, is invasive and obviously has been brought from Far East (Shaposhnikov, 1955) with saplings of introduced host plants such as poplar *Populus laurifolia*. *Pemphigus spyrothecae* is common on *P. italica* and very rare on other poplars. The species have never been registered on "wild" trees of *P. nigra* growing in floodplain of Pripyat' and other rivers in Belarusian Polesie.

As opposed to the majority of Eriosomatidae species, *P. spyrothecae* is monoecious. Dioecious aphids migrate from woody plants to woody (eight species) or herbaceous (12

species) plants. At least four Fordini species, *Forda formicaria* Heyden, 1837, *F. marginata* Koch, 1857, *Geoica urticularia* (Passerini, 1856), and *Prociphilus cimiciformis* von Heyden, 1837, inhabit plant roots and are anholocyclic under the condition of Belarus, because their primary host plants are exotic *Pistacia* spp. and absent in the local flora. Secondary host plants of *Pachypappa marsupialis* Koch, 1856 and *P. warshavensis* (Nasonov, 1894) are unknown. Poplars (*Populus* spp.) are the primary hosts of 14 species of Pemphigini, elms (*Ulmus* spp.) are the primary hosts of six species of Eriosomatini. Common spruce (*Picea abies*) is the secondary host plant for five Eriosomatidae species. Host plant species are represented by eight families. One anholocyclic species, *P. cimiciformis*, is able to feed on the roots of a great variety of plants.

Some Eriosomatidae species, *Pemphigus spyrothecae* Passerini, 1856, *P. bursarius* (Linnaeus, 1758), and *Eriosoma ulmi* (Linnaeus, 1758), are common and harmful in ornamental green stands in Belarus.

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## ADDENDA

*Electronic supplementary material.* Text file. File format: PDF. Available from: <http://www.zin.ru/journals/zsr/content.asp?year=2016>

*Explanation note.* List of species of the family Eriosomatidae in Belarus.

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